

EVALUATE STATUS OF PACIFIC LAMPREY IN THE CLEARWATER RIVER DRAINAGE, IDAHO

Annual Report 2000



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Portland, OR 97208-3621

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**EVALUATE STATUS OF PACIFIC LAMPREY IN THE CLEARWATER RIVER
DRAINAGE, IDAHO**

ANNUAL REPORT 2000

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ABSTRACT

Recent decline of Pacific lamprey *Lampetra tridentata* adult migrants to the Snake River drainage has focused attention on the species. Adult returns in 1995-1999 were more than ten magnitudes less than returns in the early 1960's. Human activities in the Snake River and Clearwater River drainages have altered ecosystem habitat in the last 100 years and likely the productive potential of Pacific lamprey habitat. Logging, stream impoundment, road construction, grazing, mining, and community development have dominated habitat alteration in the Clearwater River system and Snake River corridor. Hydroelectric projects in the Snake River corridor impact juvenile Pacific lamprey outmigrants and returning adults. Juvenile lamprey outmigrants potentially pass through turbines, turbine bypass and collection systems, and spillway structures at lower Snake River hydroelectric dams. Clearwater River drainage hydroelectric facilities including the Pacific Power and Light Dam on the Clearwater River in Lewiston, Idaho, impacted Pacific lamprey populations, however, the degree of impact is unknown (1920's-early 1970's). Hydroelectric dam construction (Harpster Dam) on the South Fork of the Clearwater River resulted in obstructed salmonid passage in the mid-1900's. Habitat alterations in the Snake River basin and Clearwater River drainage have had numerous negative effects on salmon *Oncorhynchus spp.* and steelhead trout *O. mykiss* populations (wild fish), but the magnitude of impacts on lamprey productivity and survival is unknown. Thorough understanding of Pacific lamprey habitat use and life history processes is needed to facilitate management and restoration of the species. Through Bonneville Power Administration support, the Idaho Department of Fish and Game began investigation into the status of Pacific lamprey populations in Idaho's Clearwater River drainage in 2000. Trapping, electrofishing, and spawning ground redd surveys were used to determine where Pacific lamprey persist in the South Fork of the Clearwater River drainage. Habitat surveys evaluating juvenile habitat use were primarily conducted in the Red River subbasin. Red River subbasin resource manipulations have resulted in elevated stream sediment, stream destabilization, riparian canopy reduction, and water temperature extremes. A total of 262 juvenile Pacific lamprey were captured during the 2000 field season. Sampling in the Red River drainage yielded the largest number of Pacific lamprey juveniles. Preliminary findings indicate Pacific lamprey juveniles, while present, are not numerous or widely distributed. Age of juveniles captured was determined using length frequency.

INTRODUCTION

The Pacific lamprey *Lampetra tridentata* is facing the same migratory hazards and habitat degradation as other anadromous fish species in Idaho. Because this fish is not recognized as a sport or game fish species, little attention has been given to its status. Basic life history, distribution, and population status are urgently needed to fully understand this species and to begin intensive management before extinction occurs in Idaho.

The South Fork Clearwater River (SFCR) drainage of north central Idaho is an important study area as both Pacific lamprey ammocoetes and macrothemia have been captured in outmigrant smolt traps since 1992.

Understanding juvenile fish population composition, migrational behavior, and habitat needs will provide basic information to better manage Pacific lamprey. Without this knowledge, the opportunity for preservation of critical habitat may be lost. This project will add to our knowledge of Pacific lamprey and provide critical information to minimize future degradation of habitat.

PROJECT AREA

The Clearwater River drainage is located in north central Idaho and encompasses approximately 2.5 million hectares. The SFCR, one of the four major tributaries of the Clearwater River, encompasses 300,440 hectares. The upper SFCR watershed has several large meadow complexes with low stream gradients and fine substrates. The lower SFCR reaches are predominantly canyon confined and boulder substrate dominated. In 1910 Grangeville Electric Light and Power Company built a hydroelectric dam on the SFCR at rkm 32.0. In 1937 Avista Utilities, (formerly Washington Water Power), acquired the dam. Steelhead trout *O. mykiss* migration was possible, although limited, over the dam from 1935 to 1949. High flows destroyed the fishway in 1945 eliminating adult salmonid passage until the dam was removed in 1963. Adult Pacific lamprey passage may have occurred during this entire period as adult lamprey have the ability to climb above water surface levels (G. Starke, U.S. Army Corps of Engineers, personal communications). Pacific lamprey returns to the main Clearwater River in the period following removal of the SFCR dam could have provided recolonization stock for the SFCR drainage.

The current land ownership of the SFCR watershed is U.S. Forest Service (68%), private (28%), Nez Perce Tribe (0.9%), Bureau of Land Management (2%), and State of Idaho (0.7%). Land use activities range from predominantly forestry related in the upper SFCR to livestock pasture and grazing in lower reaches. Historically, mining was centered in the upper reaches. Extensive mining from the 1860's to the mid-1900's occurred in four SFCR tributaries, Crooked River, Red River, American River, and Newsome Creek. Generally mining in the watershed has impacted fish production in varying degrees through sedimentation and instream riparian degradation. Riparian

canopy removal in the meadow complexes of the upper SFCR watershed contributes to stream temperature extremes.

OBJECTIVES

1. Determine life history characteristics of Pacific lamprey ammocoetes and macrothemia in the Clearwater River drainage.
2. Determine habitat requirements of Pacific lamprey in the Clearwater River drainage.
3. Determine distribution of Pacific lamprey in SFCR drainage.

METHODS

Electroshocking with an ABP-2 electrofisher was used to capture fish in the stream channel. Any Pacific lamprey mortalities were to be retained for statolith banding age determination, following procedures described by Beamish and Medland (1988). Determination of habitat usage and distribution was focused in the Red River drainage. We segmented Red River into one-kilometer sections from its mouth upstream to the uppermost bridge crossing. We prioritized 41 sampling locations based on random selection of kilometer section and sampled the first 100 meters of each selected section. The habitat in each of the sampled sections was classified as to type (Table 1). The first riffle, pool, glide, etc., was electroshocked from its downstream boundary upstream without repeating in identical habitat types. Water depth, water velocity, and substrate were measured and recorded at the site of individual captures. Other selected sites in the SFCR drainage were also sampled by electroshocking.

Three downstream migrant traps currently operated by Idaho Department of Fish and Game (IDFG) in the SFCR drainage were used to monitor Pacific lamprey downstream movements. The Crooked River scoop trap (rkm 1.0) was operated from March 26 to October 31. A 1.22m diameter rotary screen trap on American River (rkm 3.0) was operated from March 26 to October 31. Another 1.22m diameter rotary screen trap on Red River (rkm 6.0) was operated from March 23 to October 31.

Captured Pacific lamprey juveniles were anesthetized, and total lengths and body weights were measured. Individuals were then recovered in fresh water and released near the site of capture. All Pacific lamprey juveniles (greater than 100 mm in length) captured by electroshocking were marked with fluorescent orange elastomer on the left side behind the gill openings. Outmigrant estimates past traps were made using Beamish and Levings (1991) trap-area fished methods.

Eight kilometers of Red River and its tributaries were surveyed for spawning adult Pacific lamprey from April 19 to July 7.

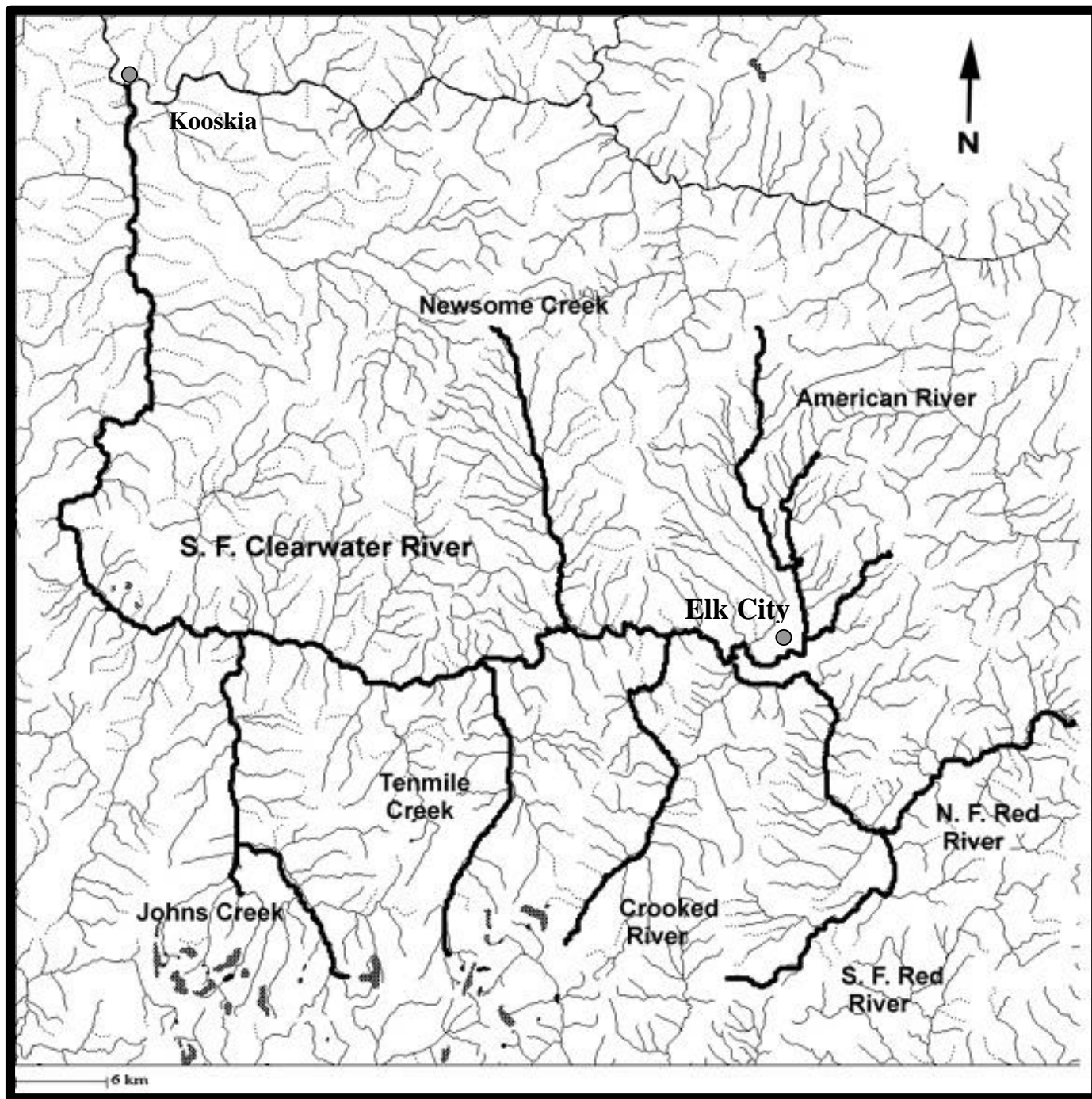


Figure 1. Geographic location of Pacific lamprey investigations in the S. F. Clearwater River drainage, 2000.

Table 1. Habitat substrate classification for sampling sites in the South Fork Clearwater River drainage.

| Habitat Units | Substrate Classification |
|---------------------|----------------------------|
| Falls | Substrate Type (mm) |
| | Large Boulder 512 + |
| Cascades | Small Boulder 256-512 |
| | Cobble 64-256 |
| Rapids | Coarse Gravel 16-64 |
| Typical | Medium Gravel 8-16 |
| Boulders | Fine Gravel 2-8 |
| Bedrock | Course Sand .5-2 |
| | Fine Sand 0.062-0.50 |
| Riffles | Silt/Organic 0.004-0.062 |
| Typical | |
| Pocket-water | |
| | |
| Glide | |
| | |
| Pools | |
| Lateral Scour Pool | |
| Straight Scour Pool | |
| Plunge Pool | |
| Dammed Pool | |
| | |
| Alcove | |

Snake River juvenile lamprey passage information at Lower Granite project was obtained from Washington Department of Fish and Wildlife in 2000. Juvenile mortality samples of macrothalmia and ammocoetes were collected. Bypass mortality, collection processes, and sampling procedures were observed at Lower Granite facility on five occasions from April 1 to July 1.

RESULTS

During 2000, no Pacific lamprey ammocoetes or macrothalmia were captured in the Crooked River scoop or the American River rotary screen traps. Fifteen Pacific lamprey ammocoetes and one macrothalmia were captured in the Red River rotary screen trap. The average total length of the ammocoetes was 125 mm and the length of the macrothalmia was 145 mm (Figure 2).

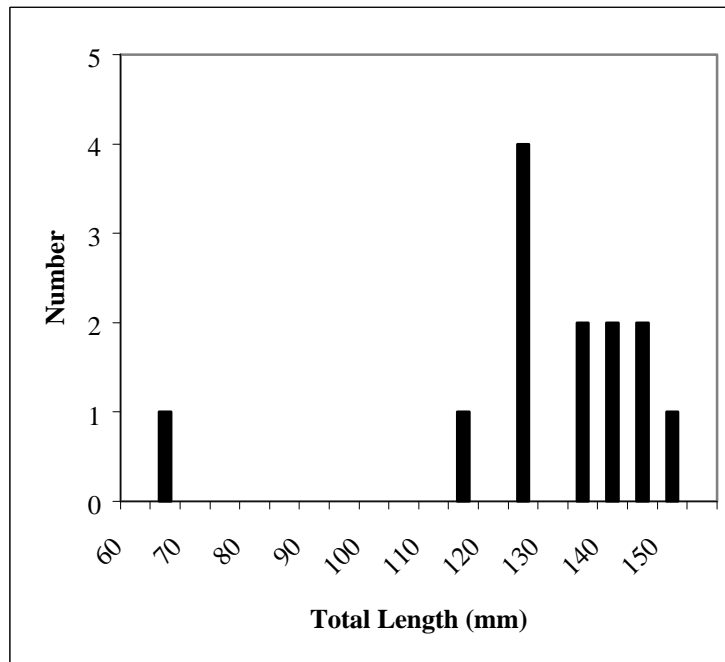


Figure 2. Length frequency of Pacific lamprey (N=13) captured in the Red River migrant trap, South Fork Clearwater River drainage, ID, 2000

Because of the low numbers of Pacific lamprey captured at traps, no mark-recapture outmigrant estimates were performed. Based on trap-area fished, a total of 93 ammocoetes and 7 macrothalmia were estimated to have migrated past the Red River trap in 2000.

Because statolith banding examination for age determination requires sacrificing individuals, no age determinations were attempted for fish captured. Future age determination may include statolith banding examination. Age assessment, based on length frequency (Figures 2-4), suggests there may be four age classes in the fish sampled.

A total of 154 Pacific lamprey ammocoetes were captured by electroshocking in Red River. Juvenile lamprey were found in three sections of Red River up to rkm 3.0, however, no sections between rkm 3.0 and 8.0 were sampled due to the randomness of selection. Tributaries of Red River (Siegal Creek, Red Horse Creek, and S.F. Red River) were sampled, but no Pacific lamprey were found. The largest Pacific lamprey captured electroshocking measured 166 mm while the smallest (found in SFCR) was 47 mm (Figure 3). No macrothalmia were captured while electroshocking.

More Pacific lamprey ammocoetes were captured in lateral scour pool habitat than any other single habitat type, however, the highest Red River density was found in the alcove (non-random) habitat type (Table 2). Individuals were mostly found inhabiting sand/silt substrate behind boulders and were captured in water depths ranging from just over 1.0 meter to less than 0.1 meter.

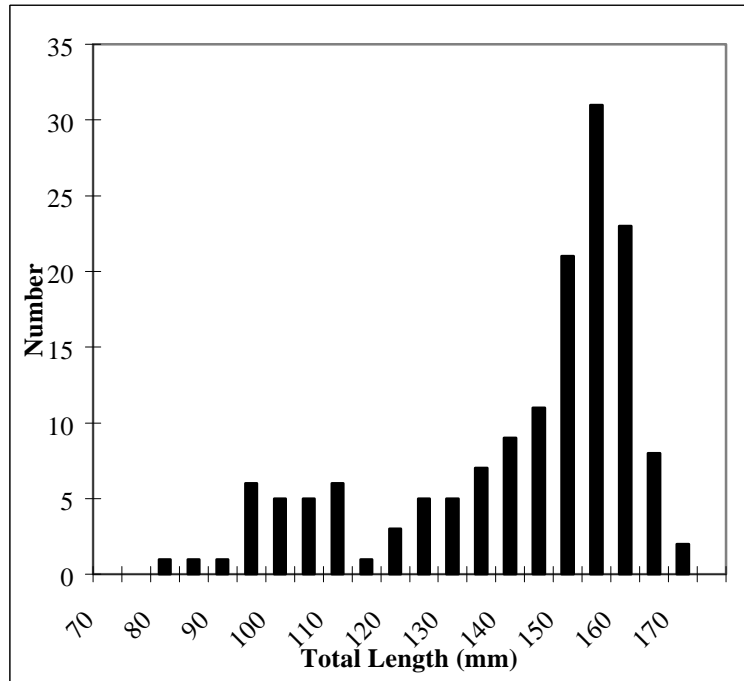


Figure 3. Length frequency of Pacific lamprey (N=154) captured by electroshocking in Red River, ID, 2000.

Although numerous potential spawning sites were identified, no adult Pacific lamprey or redds were observed during 2000 redd surveys.

Non-random habitat surveys were conducted on potential juvenile lamprey habitat sites in the main stem SFCR, American River, and Newsome Creek. Five sites were sampled in the Newsome Creek drainage from rkm 0.1 to rkm 13.4, five in the American River drainage from rkm 0.1 to rkm 18.0, and one in the SFCR at rkm 44.3, 8.8 km upstream of the Mt. Idaho bridge. No lamprey were found sampling Newsome Creek and American River. Ninety-three lamprey were sampled in the SFCR site (Figure 4).

Table 2. Habitat locations of Pacific lamprey juveniles in randomly sampled units in Red River and selected units in South Fork Clearwater River, ID, 2000.

| RED RIVER | | | | | |
|------------------------------------|-------------------------|----------------------------------------------|-----------------------------------|------------------------------|------------------------|
| Habitat Type | Lamprey Captured | Total Area Fished (m²) | Total Time Fished(Min) | Fish/100m² | CPUE(Fish/Min.) |
| Lateral Scour Pool | 99 | 1397.9 | 966 | 7.1 | 0.10 |
| Riffle | 2 | 662.6 | 325 | 0.3 | 0.01 |
| Riffle w/Pockets | 3 | 420.4 | 125 | 0.7 | 0.02 |
| Rapids w/Boulders | 4 | 175.1 | 140 | 2.3 | 0.03 |
| Straight Scour Pool | 25 | 211.3 | 170 | 11.8 | 0.15 |
| Alcove (non-random) | 19 | 7.5 | 20 | 253.3 | 0.95 |
| TOTALS: | 152 | 2874.8 | 1746 | Na | Na |
| SOUTH FORK CLEARWATER RIVER | | | | | |
| Lateral Scour (along margin) | 93 | 11.0 | 20 | 845.5 | 4.65 |

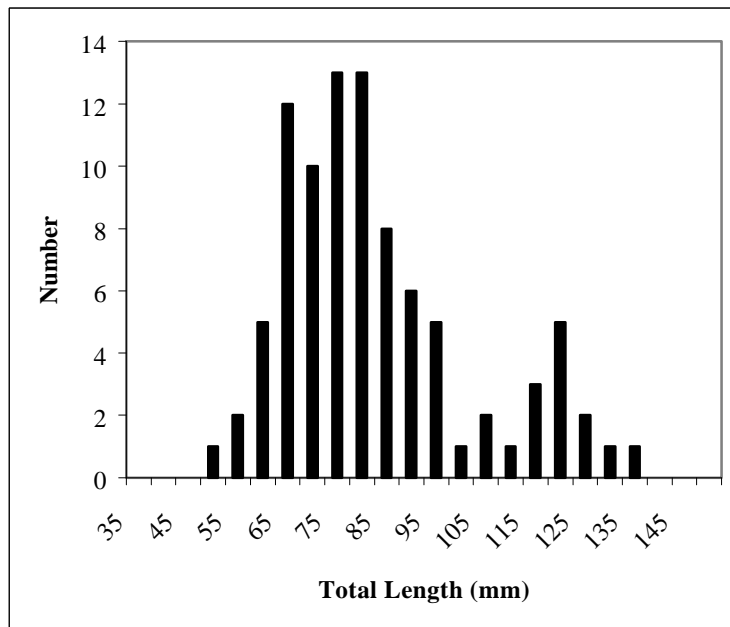


Figure 4. Length frequency of Pacific lamprey (N=93) captured by electroshocking in South Fork Clearwater River, ID, 2000.

SUMMARY AND DISCUSSION

It is not known if lamprey densities observed in 2000 reflect overall low population numbers in the SFCR drainage as the low juvenile densities would be expected following several years of a few spawning adults. Relatively high effort to catch rates were partially a result of random sampling in sections of the Red River drainage outside the expected potential habitat range. Potential juvenile habitat sampled in Newsome Creek and American River did not yield lamprey. It is possible distribution of lamprey in the SFCR basin is limited. However, further sampling needs to be completed before definitive population numbers and distribution can be determined. Length frequency distribution data indicated possibly four age classes present, assuming growth rates similar to those noted by Scott and Crossman (1973) for juveniles in native habitat. Age determination precision can only be increased with future sampling. This year's sampling (random units) found the greatest number of juveniles in lateral scour habitat type. Alcove habitat type, however, showed the highest total density per meter squared. Flow velocities are generally lower in alcoves than lateral scour pools providing energy conserving burrowing conditions for ammocoetes.

No Pacific lamprey juvenile mortalities were observed at outmigrant traps, but three mortalities were noted as a result of handling while electroshocking in the SFCR.

Juvenile lamprey passage information obtained from Washington Department of Fish and Wildlife at Lower Granite dam has not been fully reviewed. Preliminary findings indicate that the majority of juveniles pass the project between March 30 and July 1.

Both life stages (ammocoete and macrothalmia) are present in Lower Granite samples. Rearing of some ammocoetes in the Snake River pool could account for both life stages being sampled at the project.

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APPENDIX A

A1. Red River Pacific Lamprey Length and Weight

| Date Electrofished | Km/ Reach | Habitat Type | Area Fished M ² | Time Fished (Min.) | Lamprey Captured | Lamprey Measured | Length (mm) | Weight (g) | Recapture/ Marked* | Trans/ Untrans. |
|-----------------------|--------------|-----------------|----------------------------------|--------------------------|---------------------|---------------------|----------------|---------------|-----------------------|--------------------|
| 7/28/00 | 01/01 | RIP | 420.4 | 125 | 3 | 3 | 135 | 3.8 | LCO | U |
| 7/28/00 | 01/01 | RIP | | | | | 122 | 2.9 | LCO | U |
| 7/28/00 | 01/01 | RIP | | | | | 136 | 4.1 | LCO | U |
| 8/12/00 | 01/01 | LSP | 78.0 | 46 | 3 | 3 | 127 | 3.6 | LCO | U |
| 8/12/00 | 01/01 | LSP | | | | | 115 | 2.7 | LCO | U |
| 8/12/00 | 01/01 | LSP | | | | | 145 | 5.0 | LCO | U |
| 8/12/00 | 01/01 | RIF | 102.7 | 70 | 2 | 2 | 159 | 6.6 | LCO | U |
| 8/12/00 | 01/01 | RIF | | | | | 134 | 4.1 | LCO | U |
| 8/12/00 | 01/01 | RBB | na | na | 2 | | -- | -- | -- | U |
| 8/12/00 | 01/01 | RBB | | | | | -- | -- | -- | U |
| 8/12/00 | 00/09 | ALC | 7.5 | 20 | 19 | 19 | 102 | 1.4 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 150 | 5.5 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 150 | 5.7 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 116 | 2.6 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 151 | 5.6 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 140 | 4.7 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 117 | 2.9 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 105 | 1.7 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 124 | 3.1 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 80 | 1.2 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 151 | 5.8 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 156 | 6.7 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 150 | 5.2 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 148 | 6.0 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 147 | 5.6 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 157 | 7.4 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 139 | 4.2 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 119 | 3.1 | LCO | U |
| 8/12/00 | 00/09 | ALC | | | | | 128 | 3.4 | LCO | U |
| 8/13/00 | 03/04 | LSP | 150.0 | 175 | 45 | 45 | 146 | 5.8 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 150 | 5.7 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 152 | 5.5 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 162 | 7.0 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 127 | 4.3 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 135 | 4.2 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 127 | 3.7 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 125 | 3.7 | LCO | U |

*mark = LCO = left center orange

Trans = transformed

Untrans = untransformed

A1 (Con't). Red River Pacific Lamprey Length and Weight

| Date | Km/ Electrofished | Habitat Type | Area Fished M ² | Time Fished (Min.) | Lamprey Captured | Lamprey Measured | Length (mm) | Weight (g) | Recapture/ Marked* | Trans/ Untrans. |
|---------|----------------------|-----------------|----------------------------------|--------------------------|---------------------|---------------------|----------------|---------------|-----------------------|--------------------|
| 8/13/00 | 03/04 | LSP | | | | | 141 | 4.9 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 159 | 6.1 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 157 | 6.7 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 152 | 5.9 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 156 | 6.5 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 147 | 5.7 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 148 | 5.8 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 144 | 5.5 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 146 | 5.7 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 159 | 6.4 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 159 | 6.4 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 154 | 6.2 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 156 | 6.8 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 155 | 6.3 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 145 | 5.6 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 130 | 3.9 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 134 | 4.1 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 165 | 7.3 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 152 | 6.1 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 95 | 1.7 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 147 | 5.6 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 152 | 5.5 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 155 | 5.6 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 166 | 7.6 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 155 | 6.5 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 166 | 10.9 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 160 | 6.9 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 161 | 6.8 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 108 | 1.9 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 121 | 3.2 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 97 | 1.8 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 110 | 2.5 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 99 | 1.8 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 98 | 1.6 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 91 | 1.3 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 107 | 2.0 | LCO | U |
| 8/13/00 | 03/04 | LSP | | | | | 92 | 1.3 | LCO | U |
| 8/14/00 | 03/04 | LSP | 152.3 | 135 | 51 | 50 | 155 | 5.9 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 154 | 6.0 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 157 | 6.6 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 162 | 8.0 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 153 | 6.6 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 155 | 5.7 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 99 | 1.8 | LCO | U |

*mark = LCO = left center orange

Trans = transformed

Untrans = untransformed

A1 (Con't). Red River Pacific Lamprey Length and Weight

| Date | Km/ Electrofished | Habitat Type | Area Fished M ² | Time Fished (Min.) | Lamprey Captured | Lamprey Measured | Length (mm) | Weight (g) | Recapture/ Marked* | Trans/ Untrans. |
|---------|----------------------|-----------------|----------------------------------|--------------------------|---------------------|---------------------|----------------|---------------|-----------------------|--------------------|
| 8/14/00 | 03/04 | LSP | | | | | 157 | 7.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 155 | 6.5 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 138 | 4.5 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 152 | 6.3 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 158 | 7.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 148 | 5.5 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 157 | 6.5 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 156 | 6.4 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 142 | 5.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 149 | 5.8 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 142 | 5.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 155 | 7.2 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 152 | 6.2 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 150 | 5.2 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 139 | 4.4 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 155 | 6.3 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 147 | 5.2 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 97 | 1.9 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 93 | 1.9 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 160 | 7.9 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 148 | 5.6 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 147 | 6.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 155 | 7.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 125 | 3.6 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 152 | 5.8 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 106 | 2.0 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 137 | 4.6 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 151 | 6.2 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 160 | 7.6 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 158 | 6.5 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 143 | 5.0 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 135 | 4.5 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 109 | 2.4 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 109 | 2.8 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 152 | 6.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 137 | 4.2 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 142 | 4.8 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 87 | 1.3 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 94 | 1.4 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 145 | 5.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 156 | 6.2 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 85 | 1.1 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | 103 | 1.8 | LCO | U |
| 8/14/00 | 03/04 | LSP | | | | | -- | -- | -- | U |

*mark = LCO = left center orange

Trans = transformed

Untrans = untransformed

A1 (Con't). Red River Pacific Lamprey Length and Weight

| Date Electrofished | Km/ Reach | Habitat Type | Area | Time | Lamprey Captured | Lamprey Measured | Length (mm) | Weight (g) | Recapture/ Marked* | Trans/ Untrans. |
|-----------------------|--------------|-----------------|--------------------------|------------------|---------------------|---------------------|----------------|---------------|-----------------------|--------------------|
| | | | Fished M ² | Fished (Min.) | | | | | | |
| 8/16/00 | 03/04 | RBB | 128.0 | 100 | 4 | 4 | 155 | 6.4 | LCO | U |
| 8/16/00 | 03/04 | RBB | | | | | 156 | 6.2 | LCO | U |
| 8/16/00 | 03/04 | RBB | | | | | 159 | 7.3 | LCO | U |
| 8/16/00 | 03/04 | RBB | | | | | 157 | 6.1 | LCO | U |
| 9/9/00 | 03/04 | SCP | 199.9 | 170 | 25 | 25 | 136 | 3.8 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 143 | 5.3 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 152 | 6.0 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 147 | 5.7 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 162 | 6.9 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 165 | 7.1 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 155 | 5.7 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 153 | 5.9 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 144 | 4.9 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 161 | 6.5 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 132 | 3.7 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 150 | 6.1 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 150 | 5.3 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 104 | 2.1 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 101 | 2.0 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 154 | 5.7 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 153 | 5.5 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 148 | 5.8 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 165 | 7.4 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 151 | 6.3 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 157 | 5.7 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 152 | 6.4 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 135 | 4.3 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 140 | 4.4 | LCO | U |
| 9/9/00 | 03/04 | SCP | | | | | 92 | 1.5 | LCO | U |
| TOTAL | | | 1238.8 | 841 | 154 | 151 | | | | |

*mark = LCO = left center orange

Trans = transformed

Untrans = untransformed

A2. South Fork Clearwater River Pacific Lamprey Length and Weight

| Date Electrofished | Km/ Reach | Habitat Type | Area | Time | Lamprey Captured | Lamprey Measured | Length (mm) | Weight (g) | Recapture/ Marked* | Trans./ Untrans. |
|-----------------------|--------------|-----------------|--------------------------|-----------------|---------------------|---------------------|----------------|---------------|-----------------------|---------------------|
| | | | Fished M ² | Fished (Min) | | | | | | |
| 9/10/00 | 44.3/na | LSP | 11.0 | 20 | 93 | 91 | 57 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 70 | 0.7 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 70 | 0.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 66 | 0.7 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 52 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 67 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 62 | 0.4 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 65 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 81 | 1.1 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 79 | 0.9 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 70 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 75 | 0.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 55 | 0.3 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 77 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 71 | -- | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 61 | 0.6 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 78 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 81 | 1.1 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 75 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 81 | 1.2 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 115 | 1.6 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 116 | 2.3 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 63 | 0.4 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 61 | 0.4 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 83 | 1.0 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 77 | 0.9 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 60 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 65 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 100 | 1.6 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 103 | 2.4 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 79 | 1.0 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 71 | 0.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 120 | 2.7 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 73 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 63 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 75 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 67 | 0.6 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 57 | 0.4 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 69 | 0.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 78 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 59 | 0.4 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 75 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 79 | 0.9 | -- | U |

Mark = LCO = left center orange

Trans = transformed

Untrans = untransformed

A2. (Con't). South Fork Clearwater River Pacific Lamprey Length and Weight

| Date | Km/ Electrofished | Habitat Type | Area Fished M ² | Time Fished (Min) | Lamprey Captured | Lamprey Measured | Length (mm) | Weight (g) | Recapture/ Marked* | Trans./ Untrans. |
|---------|----------------------|-----------------|----------------------------------|-------------------------|---------------------|---------------------|----------------|---------------|-----------------------|---------------------|
| 9/10/00 | 44.3/na | LSP | | | | | 75 | 0.9 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 47 | 0.2 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 77 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 124 | 3.0 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 86 | 1.2 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 75 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 89 | 1.2 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 89 | 1.3 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 87 | 1.3 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 135 | 4.0 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 119 | 2.8 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 92 | 1.3 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 66 | 0.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 75 | 0.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 80 | 1.0 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 65 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 59 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 74 | 0.7 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 73 | 0.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 62 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 82 | 1.0 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 83 | 1.3 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 116 | 2.6 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 92 | 1.3 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 107 | 2.1 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 116 | 2.4 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 129 | 3.6 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 79 | 1.1 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 93 | 1.4 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 61 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 77 | 0.9 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 85 | 1.0 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 65 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 75 | 0.8 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 68 | 0.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 80 | 1.1 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 95 | 1.6 | LCO | U |
| 9/10/00 | 44.3/na | LSP | | | | | 115 | 2.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 102 | 1.7 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 84 | 1.1 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 121 | 2.9 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 115 | 2.6 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 90 | 1.2 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 70 | 0.7 | -- | U |

Mark = LCO = left center orange

Trans = transformed

Untrans = untransformed

A2. (Con't). South Fork Clearwater River Pacific Lamprey Length and Weight

| Date | Km/ Electrofished | Habitat Type | Area Fished M ² | Time Fished (Min) | Lamprey Captured | Lamprey Measured | Length (mm) | Weight (g) | Recapture/ Marked* | Trans./ Untrans. |
|---------------|----------------------|-----------------|----------------------------------|-------------------------|---------------------|---------------------|----------------|---------------|-----------------------|---------------------|
| 9/10/00 | 44.3/na | LSP | | | | | 76 | 0.9 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 62 | 0.5 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 92 | 1.3 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | 88 | 1.3 | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | -- | -- | -- | U |
| 9/10/00 | 44.3/na | LSP | | | | | -- | -- | -- | U |
| TOTALS | | | 11.0 | 20 | 93 | 91 | | | | |

Mark = LCO = left center orange

Trans = transformed

Untrans = untransformed

A3. Red River Habitat Surveys for Electrofished Units

RED RIVER SURVEYS OF UNITS ELECTROFISHED FOR LAMPREY

Sample Personnel: Claire, Peterson

| | | UNIT MEASUREMENTS | | | | | | | | |
|-----------------|----------------------|-------------------|----------|--------|-------|-----------|---------|---------|------|-------|
| HABITAT UNIT | | | LAMPREY | Length | Slope | Max Depth | Channel | Wetted | Area | |
| (Km from Mouth) | DATE | TIME | CAPTURED | (m) | % | (m) | AVG (m) | AVG (m) | (m²) | |
| | | | | | | | | | | |
| LSP | LATERAL SCOUR POOL | | | | | | | | | |
| | 1.033 - 1.045 | 27-Jul-00 | 9:30 AM | 3 | 13 | 0.5 | 0.8 | na | 6 | 78.0 |
| | 26.9084 - 26.9258 | 29-Jul-00 | 11:30 AM | 0 | 17.4 | 0.5 | 0.5 | 10.5 | 8.8 | 153.1 |
| | 26.9258 - 26.9428 | 29-Jul-00 | 12:10 PM | 0 | 17 | 0.25 | 0.7 | 8.8 | 7.0 | 119.0 |
| | 26.9513 - 26.9713 | 29-Jul-00 | 3:25 PM | 0 | 20 | 0.5 | 0.8 | 8.4 | 6.6 | 132.0 |
| | 20.63 - 20.719 | 30-Jul-00 | 8:00 AM | 0 | 33 | 2 | 0.75 | 10.9 | 13.1 | 432.3 |
| | 3.4 - 3.43 | 10-Aug-00 | 9:25 AM | 95 | 30 | 0.5 | 0.9 | 13.0 | 10.1 | 303.0 |
| | 33.982- 34.0115 | 25-Aug-00 | 8:40 AM | 0 | 29.5 | 0.25 | 0.55 | 7.1 | 6.1 | 180.0 |
| SCP | STRAIGHT SCOUR POOL | | | | | | | | | |
| | 3.482 - 3.498 | 9-Sep-00 | 10:00 AM | 25 | 16 | 0.25 | 0.65 | 16.2 | 14.1 | 199.9 |
| RIF | RIFFLE | | | | | | | | | |
| | 1.033 - 1.045 | 12-Aug-00 | 9:30 AM | 2 | 13 | 0.5 | 0.8 | 12.2 | 7.9 | 102.7 |
| | 26.882 - 26.9084 | 30-Jul-00 | 8:10 AM | 0 | 26.4 | 0.75 | 0.25 | 11.2 | 10.3 | 271.9 |
| | 26.9428 - 26.9513 | 1-Aug-00 | 8:15 AM | 0 | 8.5 | 1 | 0.35 | 10.4 | 8.0 | 68.0 |
| | 20.6 - 20.63 | 10-Aug-00 | 8:00 AM | 0 | 30 | 1 | 0.4 | 8.5 | 7.3 | 219.0 |
| RIP | RIFFLE WITH POCKETS | | | | | | | | | |
| | 1.0 - 1.033 | 28-Jul-00 | 8:25 AM | 3 | 28.5 | 1.25 | 0.75 | 18.3 | 14.8 | 421.8 |
| RBB | RAPIDS WITH BOULDERS | | | | | | | | | |
| | 1.0641 - 1.0681 | 15-Aug-00 | 9:00 AM | 0 | 4 | 0.75 | 0.7 | 13.9 | 11.7 | 46.8 |
| | 3.43 - 3.444 | 16-Aug-00 | 8:35 AM | 4 | 14 | 3 | 0.55 | 12.1 | 9.2 | 128.8 |
| ALC | ALCOVE | | | | | | | | | |
| | 0.99 | 12-Aug-00 | 1:00 PM | 19 | 2.2 | 0 | 0.4 | | 3.4 | 7.5 |

A3 (Con't). Red River Habitat Surveys for Electrofished Units

RED RIVER SURVEYS OF UNITS ELECTROFISHED FOR LAMPREY

Sample Personnel: Claire, Peterson

| HABITAT UNIT (Km from Mouth) | WATER VELOCITIES (m/sec)*** | | | | | | STREAM SHADE | | | | |
|---------------------------------|-----------------------------|-------|--------------------|-------|-------|-------|--------------|---------|----------|-----------|-------|
| | Substrate | | 60% from substrate | | | | LEFT BNK | CNTR UP | CNTR DWN | RIGHT BNK | TOTAL |
| | 25% | 50% | 75% | 25% | 50% | 75% | | | | | |
| LSP | | | | | | | | | | | |
| 1.033 - 1.045 | 0.287 | 0.491 | 0.454 | * | 0.500 | 0.456 | 0.0% | 0.0% | 0.0% | 7.5% | 7.5% |
| 26.9084 - 26.9258 | 0.217 | 0.271 | 0.232 | * | * | * | 24.0% | 0.0% | 0.0% | 10.5% | 34.5% |
| 26.9258 - 26.9428 | 0.130 | 0.141 | 0.194 | 0.388 | 0.359 | 0.272 | 0.0% | 0.0% | 0.0% | 3.5% | 3.5% |
| 26.9513 - 26.9713 | 0.246 | 0.298 | 0.136 | 0.219 | 0.348 | 0.220 | 0.0% | 7.5% | 0.0% | 15.0% | 22.5% |
| 20.63 - 20.719 | 0.054 | 0.152 | 0.126 | 0.152 | 0.253 | * | 10.5% | 0.0% | 0.0% | 4.5% | 15.0% |
| 3.4 - 3.43 | 0.028 | 0.201 | 0.181 | 0.032 | 0.343 | * | 25.0% | 1.5% | 4.5% | 13.5% | 44.5% |
| 33.982 - 34.0115 | 0.201 | 0.048 | 0.308 | * | 0.362 | * | 0.0% | 0.0% | 6.0% | 4.5% | 10.5% |
| SCP | | | | | | | | | | | |
| 3.482 - 3.498 | 0.574 | 0.047 | 0.180 | * | 0.349 | * | 9% | 1.50% | 3% | 22.50% | 36% |
| RIF | | | | | | | | | | | |
| 1.033 - 1.045 | 0.287 | 0.491 | 0.454 | * | 0.500 | 0.456 | 0.0% | 0.0% | 0.0% | 7.5% | 7.5% |
| 26.882 - 26.9084 | 0.468 | 0.772 | 0.088 | * | * | * | 18.0% | 0.0% | 0.0% | 6.0% | 24.0% |
| 26.9428 - 26.9513 | 0.313 | 0.617 | 0.455 | * | * | * | 0.0% | 0.0% | 0.0% | 3.0% | 3.0% |
| 20.6 - 20.63 | 0.474 | 0.833 | 0.531 | * | * | * | 12.0% | 1.5% | 3.0% | 1.5% | 18.0% |
| RIP | | | | | | | | | | | |
| 1.0 - 1.033 | 0.397 | 0.378 | 0.545 | * | * | * | 12.0% | 1.5% | 0.0% | 25.0% | 38.5% |
| RBB | | | | | | | | | | | |
| 1.0641 - 1.0681 | 0.633 | 0.840 | 0.264 | * | * | * | Not taken | | | | |
| 3.43 - 3.444 | 0.297 | 0.065 | 0.610 | * | * | * | 10.5% | 3.0% | 4.5% | 10.5% | 28.5% |
| Alcove | | | | | | | | | | | |
| 0.99 | ** | ** | ** | | | | 0% | 7.5% | 10.5% | 15.0% | 33.0% |

* Water too shallow for velocity to be taken

** Flow less than lower limit of standard speed rotor

*** Substrate = ~ 5 cm above substrate 60% = 60% up water column percentages from left bank facing upstream (25%, stream center, 75%)

A3 (Con't). Red River Habitat Surveys for Electrofished Units

RED RIVER SURVEYS OF UNITS ELECTROFISHED FOR LAMPREY

Sample Personnel: Claire, Peterson

| HABITAT UNIT (Km from Mouth) | SUBSTRATE COMPOSITION % | | | | | | | | | |
|---------------------------------|-------------------------|-------------|--------|-----------------|--------------|--------------|----------------|--------------|---------------|-------------|
| | LG. BLDR | SM. BLDR | COBBLE | COARSE GRVL. | MED. GRVL | FINE GRVL | COARSE SAND | FINE SAND | SILT/ ORG. | BED ROCK |
| LSP | | | | | | | | | | |
| 1.033 - 1.045 | 20% | 23% | 14.5% | 12% | 5% | 5% | 10% | 10% | 0.5% | |
| 26.9084 - 26.9258 | 1% | 25% | 28% | 15% | 8% | 8% | 8% | 5% | 2% | |
| 26.9258 - 26.9428 | 2% | 35% | 20% | 10% | 5% | 11% | 10% | 5% | 2% | |
| 26.9513 - 26.9713 | 2% | 15% | 27% | 16% | 8% | 8% | 10% | 5% | 9% | |
| 20.63 - 20.719 | 2% | 4% | 33% | 20% | 10% | 10% | 10% | 3% | 8% | |
| 3.4 - 3.43 | 33% | 15% | 8% | 7% | 5% | 15% | 8% | 7% | 2% | |
| 33.982- 34.0115 | 0% | 12% | 40% | 5% | 10% | 15% | 6% | 8% | 4% | |
| SCP | | | | | | | | | | |
| 3.482 - 3.498 | 12% | 25% | 20% | 19% | 5% | 5% | 5% | 5% | 1% | 3% |
| RIF | | | | | | | | | | |
| 1.033 - 1.045 | 20% | 23% | 14.5% | 12% | 5% | 5% | 10% | 10% | 0.5% | |
| 26.882 - 26.9084 | 0% | 10% | 40% | 18% | 5% | 5% | 10% | 10% | 2% | |
| 26.9428 - 26.9513 | 0% | 20% | 35% | 21% | 5% | 8% | 5% | 5% | 1% | |
| 20.6 - 20.63 | 0.5% | 3% | 41% | 20% | 12% | 8% | 8% | 7% | 0.5% | |
| RIP | | | | | | | | | | |
| 1.0 - 1.033 | 25% | 30% | 17% | 7% | 5% | 5% | 8% | 2% | 1% | |
| RBB | | | | | | | | | | |
| 1.0641 - 1.0681 | 37.5% | 27% | 15% | 5% | 5% | 5% | 3% | 2% | 0.5% | |
| 3.43 - 3.444 | 35% | 20% | 12% | 8% | 5% | 8% | 7% | 3% | 2% | |
| Alcove | | | | | | | | | | |
| 0.99 | 20% | 10% | 2% | 2% | 3% | 5% | 5% | 35% | 18% | |

APPENDIX B

EXPENDITURES
(As of December 31, 2000)

| | |
|--------------------|----------|
| Personnel | \$25,711 |
| Personnel Benefits | 9,528 |

| | |
|--------------------|----------|
| Subtotal Personnel | \$35,239 |
|--------------------|----------|

| | |
|-----------------|----------|
| Supplies | \$13,314 |
| Travel | 200 |
| Subcontractor | 5,000 |
| Indirect Charge | 11,019 |

| | |
|--------------------|----------|
| Subtotal Operating | \$29,533 |
|--------------------|----------|

| | |
|-------|----------|
| Total | \$64,772 |
|-------|----------|